day 34

1969 AB7

a) $y = \frac{e^x + e^{-x}}{2}$ graph it! doesn't warrant the response "I give up"

→ horiz asymptote / end behavior / $\lim_{x \to +\infty / -\infty} f(x)$

→ vertical asymptotes

→ y-intercept

→ x-intercepts

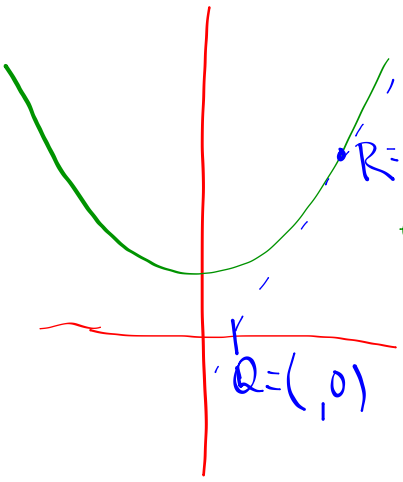
→ derivative → sign chart → increasing / decreasing

day 34

b) $y = \frac{e^x + e^{-x}}{2}$

$y' = \frac{e^x - e^{-x}}{2}$

$y'(r) = \frac{e^r - e^{-r}}{2}$



eqn of tan line $y - L = \left(\frac{e^r - e^{-r}}{2}\right)(x - r)$

$-L = \left(\frac{e^r - e^{-r}}{2}\right)(x) - \left(\frac{e^r - e^{-r}}{2}\right)r$

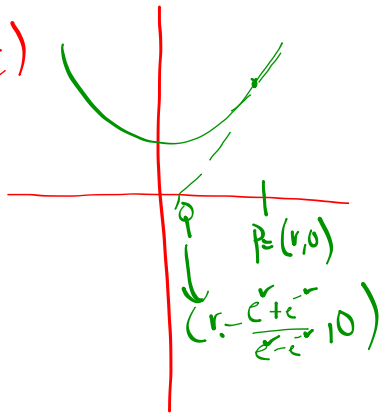
$\left(\frac{e^r - e^{-r}}{2}\right)r - L = \frac{e^r - e^{-r}}{2}x$

$r - \frac{2L}{e^r - e^{-r}} = x$

$r - \frac{e^r + e^{-r}}{e^r - e^{-r}} = r - 2\left(\frac{e^r + e^{-r}}{2}\right) = x\text{-int}$

$\overline{e^r - e^{-r}}$

c)



length of $\overline{PQ} = r - \left[r - \frac{e^r + e^{-r}}{e^r - e^{-r}}\right]$

$= \frac{e^r + e^{-r}}{e^r - e^{-r}}$

$\lim_{r\to\infty} \frac{e^r + e^{-r}}{e^r - e^{-r}} = \lim_{r\to\infty} \frac{e^r(1 + e^{-2r})}{e^r(1 - e^{-2r})}$

$= 1$

Oct 17-7:28 AM

day 34

1970/AB5

$\frac{d}{dx}\left(f(g(x))\right) = f'(g(x)) \cdot g'(x)$

$x = \sin(e^t)$

$v = f'(t)$

$f'(t) = f'(g(x)) \cdot g'(x)$

$v = \cos(e^t) \cdot e^t = e^t \cos(e^t)$

$a(t) = f'(v)\, v'(t)$

$f'(v) = f'g \cdot fg'$

$(e^t)^2 = e^t \cdot e^t = e^{t+t} = e^{2t}$

$a(t) = \left(e^t \cdot (-\sin(e^t))\right) \cdot e^t + \left(\cos(e^t)\right) \cdot e^t$

$\frac{d}{dt}\left(\cos(e^t)\right) \cdot e^t + \cos(e^t) \cdot \frac{d}{dt} e^t$

$=$

$e^{\ln x} = x$ and $\ln e^x = x$

day 34

$v(t) = \cos(e^t)(e^t)$

$0 = \cos(e^t)(e^t)$

$\frac{0}{e^t} = \cos(e^t)$

$\cos^{-1}(0) = e^t$

$\ln \cos^{-1}(0) = t$

$\ln \frac{\pi}{2} = t$

$\ln \frac{\pi}{2} = t$

$\ln \frac{3\pi}{2}$

$\ln \frac{5\pi}{2}$

⋮

day 34

3.6/28) $P(L) = 200L + 10L^2 - L^3$

average output $A(L) = \frac{P(L)}{L} = 200 + 10L - L^2$

marginal product $M(L) = \frac{dP}{dL} = 200 + 20L - 3L^2$

[& graph]

b) $A'(L_0) = 0$ $A'(L) = 10 - 2L$

$A'(L_0) = 0 \Rightarrow L_0 = 5$

$M(L_0) = M(5) = 200 + 20(5) - 3(5)^2 = 225$

$A(L_0) = A(5) = 200 + 10(5) - (5)^2 = 225$ ✓

Oct 17-7:28 AM

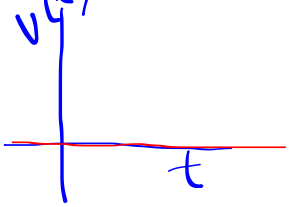
day 34

3.6/19) If the acceleration is constant, then velocity is constant.

FALSE

b) if acc=0 then vel is constant,

c) it is impossible for $v(t)$ (on $a \le t \le b$) $= \frac{v(t)}{\text{average velocity}}$.



d) A moving object can have neg accel AND increasing SPEED.

day 34

3.7/12) $y = \sqrt{7x-1} = \text{sqrt}(7x-1)$

$y' = \frac{d}{dx}(\text{sqrt})\Big|_{7x-1} \cdot \frac{d}{dx}(7x-1)$ $\qquad e^x = \exp(x)$

$y = \sqrt{x}\,7 = x^{1/2}$

$y' = \frac{1}{2}x^{-\frac{1}{2}} = \frac{1}{2x^{1/2}}$

$= \frac{1}{2\sqrt{x}}$

$\Downarrow$

$\frac{1}{2\sqrt{7x-1}} \cdot (7) = \frac{7}{2\sqrt{7x-1}}$